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Title: Confirmation of Non-Impacted Status (TA-16-306)

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Confirmation of Non-Impacted Status (TA-16-306)

Summary

EPC-ES finds that the materials associated with TA-16-306 (see Figure 1) are candidate for release to the public for recycle or as sanitary/commercial waste. This finding is consistent with the requirements of DOE Order 458.1 *Radiation Protection of the Public and the Environment* and LANL procedure EPC-ES-FSD-004, *Environmental Radiation Protection*.

Introduction

The TA-16-306 building was originally constructed as a high explosives processing facility. In the late 1950s the building was converted to support the plastics operations at TA-16. A proposal was made in 2008 for the building to be remodeled and archival photographs of the interior of the building were taken in preparation for the proposed remodeling. After archival photographs were taken, the remodeling project was cancelled and the building has been unoccupied ever since. There are no known radiological operations that occurred in the history of the building and no radiological postings.

Figure 1. Image showing TA-16-306 and walkways



Survey overview

Sentinel surveys were conducted to confirm the non-impacted status of this building. Potential disposition pathways for the material include disposition as Low Level Waste, release of concrete and metal for recycling, and/or release of debris for disposal at commercial/municipal landfills. Data quality objectives for transfer of items into the public domain are described in ENV-ES-TPP-001, R1 (2015a).

Direct measurements were made using a Ludlum 43-93 probe coupled with a Thermo Scientific RadEye SX instrument. NUCON smears were used to collect removable samples and were counted using a Berthold 2010/143. Surveyor instructions are given in Table 1. Because the building was being evaluated for non-impacted status, it was required to meet the indistinguishable from background (IFB) criteria. LANL previously documented the radiological characteristics of comparable reference materials for evaluating survey results and

demonstrating IFB for personal property (LANL 2015b), and these reference measurements were recently updated for the RadEye/43-93 instrumentation.

Table 1: Surveyor instructions for sampling at TA-16-306.

TA-16-306 Sampling and Analysis Plan Requirements				
Survey Unit #	Description	Direcets & Smears	Scanning	Other
16-306 First Floor				
16-306-101	floors, walls, ceiling, equipment	~25 Grid ~10 Biased	<5%	Alpha Beta
16-306-102	floors, walls, ceiling, equipment	~25 Grid ~10 Biased	<5%	Alpha Beta
16-306-104	floors, walls, ceiling, equipment	~ 25 Grid ~10 Biased	<5%	Alpha Beta
16-306-105	floors, walls, ceiling, equipment	~ 25 Grid ~10 Biased	<5%	Alpha Beta
16-306-106	floors, walls, ceiling, equipment	~ 25 Grid ~10 Biased	<5%	Alpha Beta
16-306-107	floors, walls, ceiling, equipment	~ 25 Grid ~10 Biased	<5%	Alpha Beta
16-306-Janitors Closet	floors, walls, ceiling, equipment	~ 25 Grid ~10 Biased	<5%	Alpha Beta
16-306-Corridor #1	floors, walls, ceiling, equipment	~ 25 Grid ~10 Biased	<5%	Alpha Beta
16-306-Corridor #2	floors, walls, ceiling, equipment	~ 25 Grid ~10 Biased	<5%	Alpha Beta
16-306-Interior N Exterior Corridor	floors, walls, ceiling, equipment	~ 25 Grid ~10 Biased	<5%	Alpha Beta
16-306-Interior S Exterior Corridor	floors, walls, ceiling, equipment	~ 25 Grid ~10 Biased	<5%	Alpha Beta
16-306 Basement				
16-306-1	floors, walls, ceiling, equipment	~30 Grid ~10 Biased	<5%	Alpha Beta
16-306-2	floors, walls, ceiling, equipment	~30 Grid ~10 Biased	<5%	Alpha Beta
16-306 Exterior				
	walls	~12 Grid ~10 Biased	<5% floor	Alpha Beta

Results

TA-16-306 contains numerous rooms, several long corridors, and a basement. The building contains six types of building material types (bare and painted concrete, bare and painted metal, ceramic tile, and some miscellaneous items). In the initial evaluation of survey data, 3 of the 6 rooms, one corridor, and a closet failed to meet IFB by a Wilcoxon rank-sum (WRS) test for at least one building material type. Survey results indicate that the failing material type was mostly ceramic tile, and in one case each, bare metal and painted concrete. The IFB failures occurred only for direct measurements of building surfaces. Smear surveys indicated that there is no removable radioactive material present in the building. The lack of any removable radioactive material implies that it is unlikely that LANL-derived radionuclides spread throughout the building. Since there is no history of criticality or other experiments which could cause widespread activation of building materials, it seemed initially unlikely that the elevated direct-count results were the result of LANL operations.

EPC-ES health physics staff performed gamma spectroscopy measurements in TA-16-306 to determine what was causing the elevated direct count results. Measurements of approximately five minutes were taken at four locations at the same locations and for the same material types where RCT direct measurements showed elevated counts. One 36-hour background measurement was also taken away from the building. Figures 2-5 show the spectra taken inside the TA-16-306 building and Figure 6 shows the background spectrum.

Figure 2. Gamma Spectrum for TA-16-306-102: Ceramic tile (497 seconds)

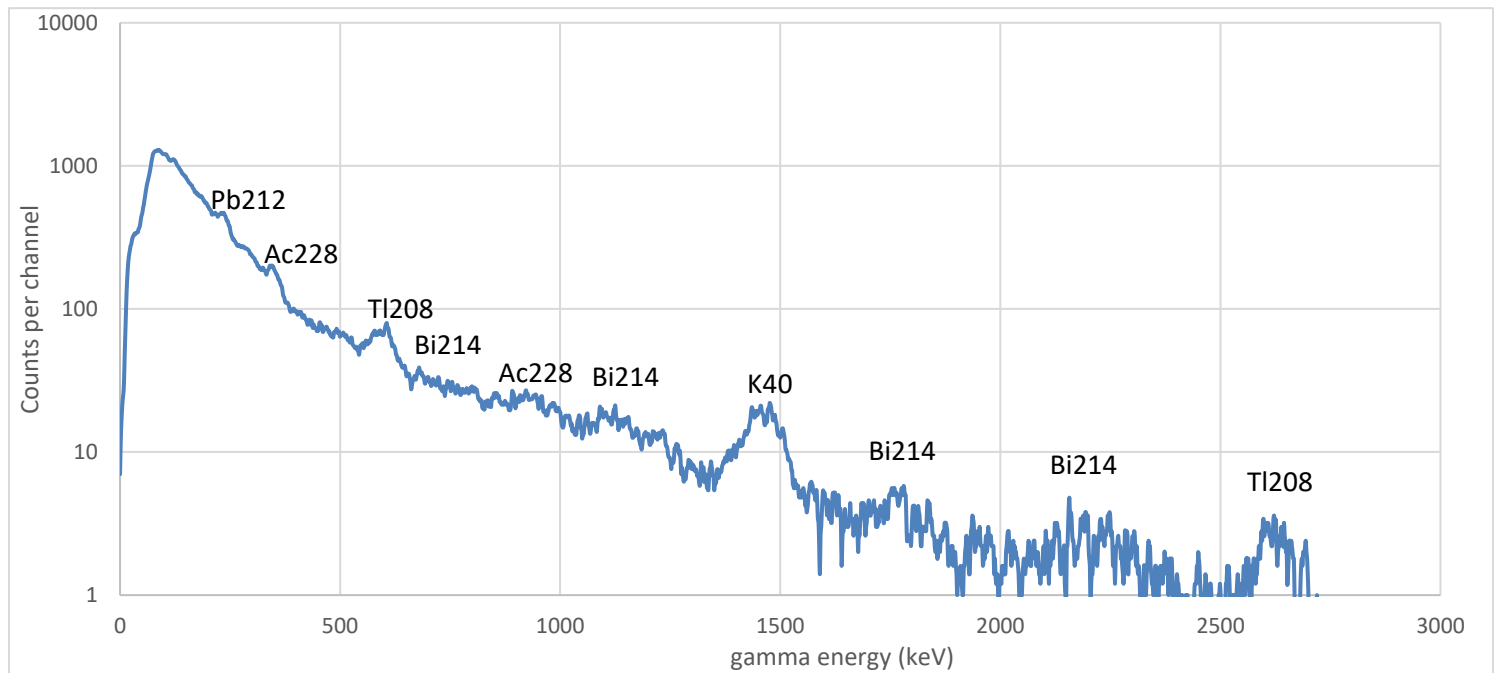


Figure 3. Gamma Spectrum for TA-16-306-102: Ceramic tile (231 seconds)

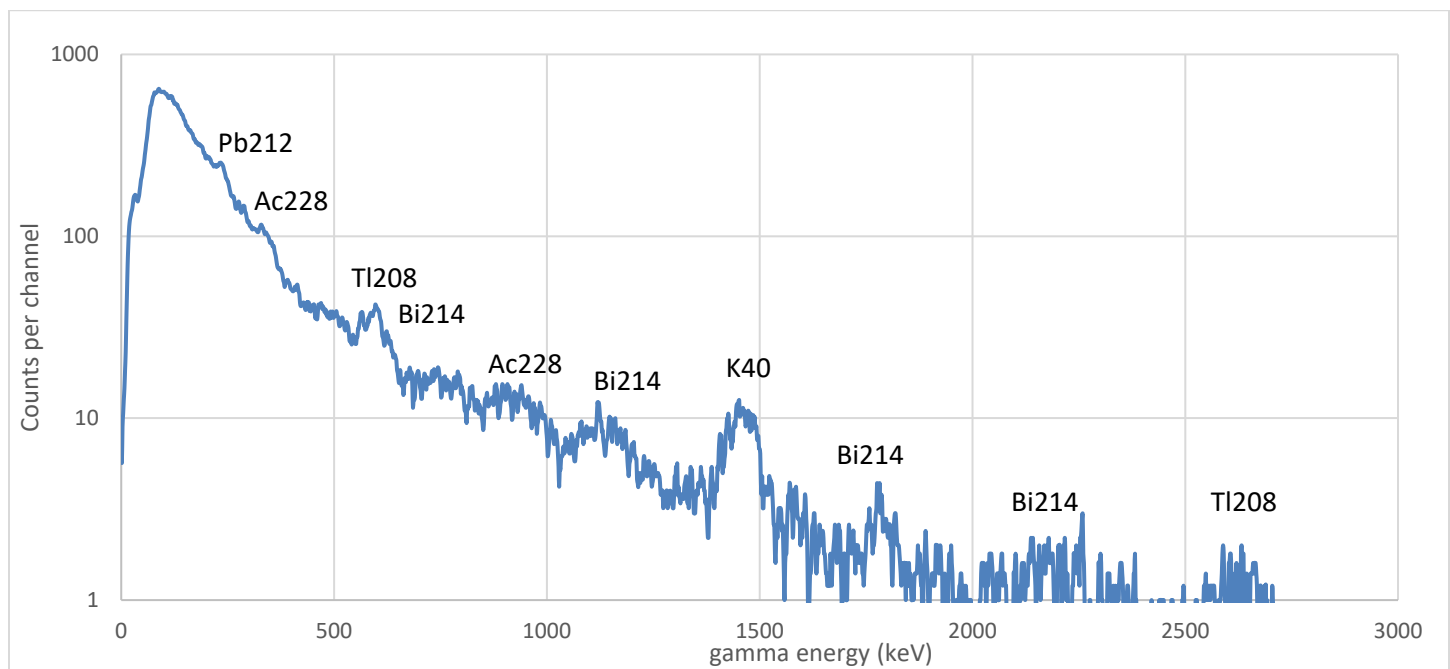


Figure 4. Gamma Spectrum for TA-16-306-102: Concrete (312 seconds)

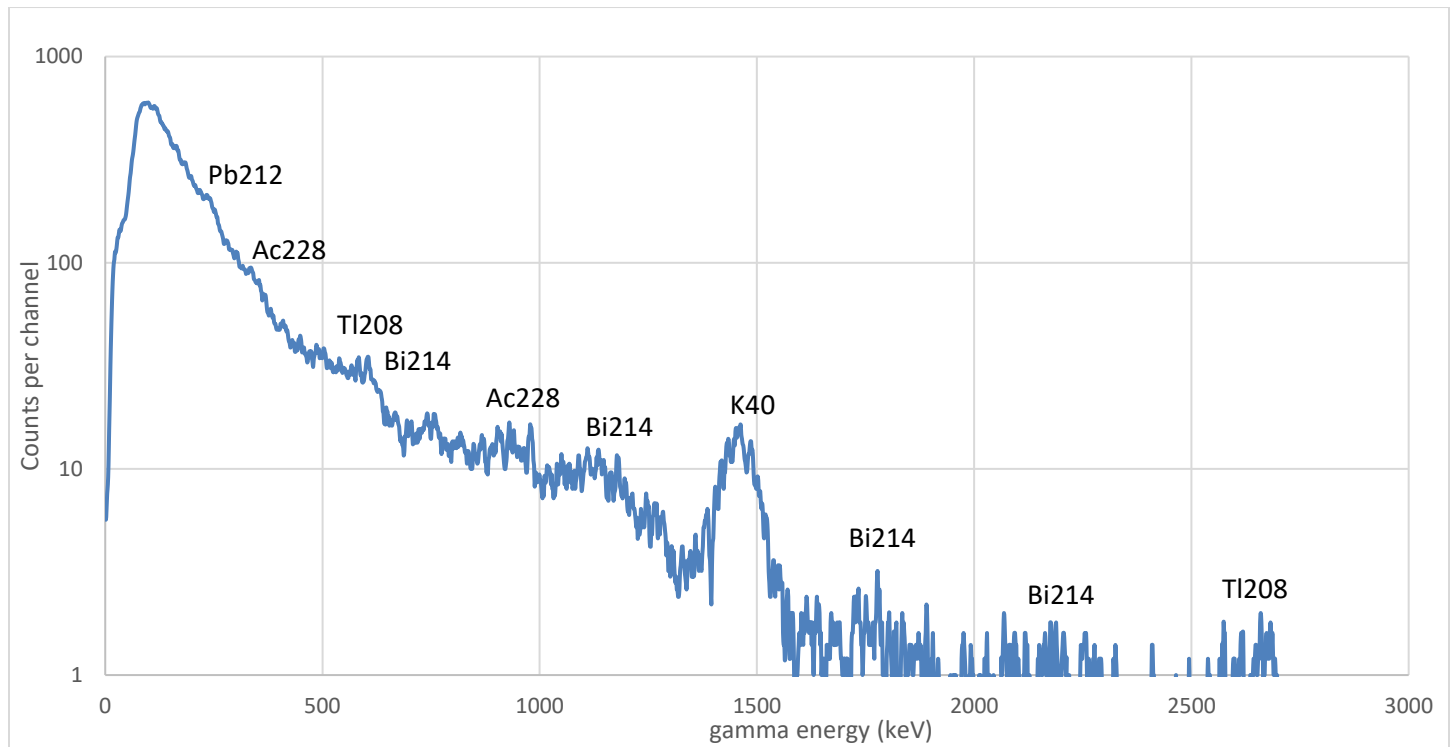


Figure 5. Gamma Spectrum for TA-16-306-102: Aluminum wall (312 seconds)

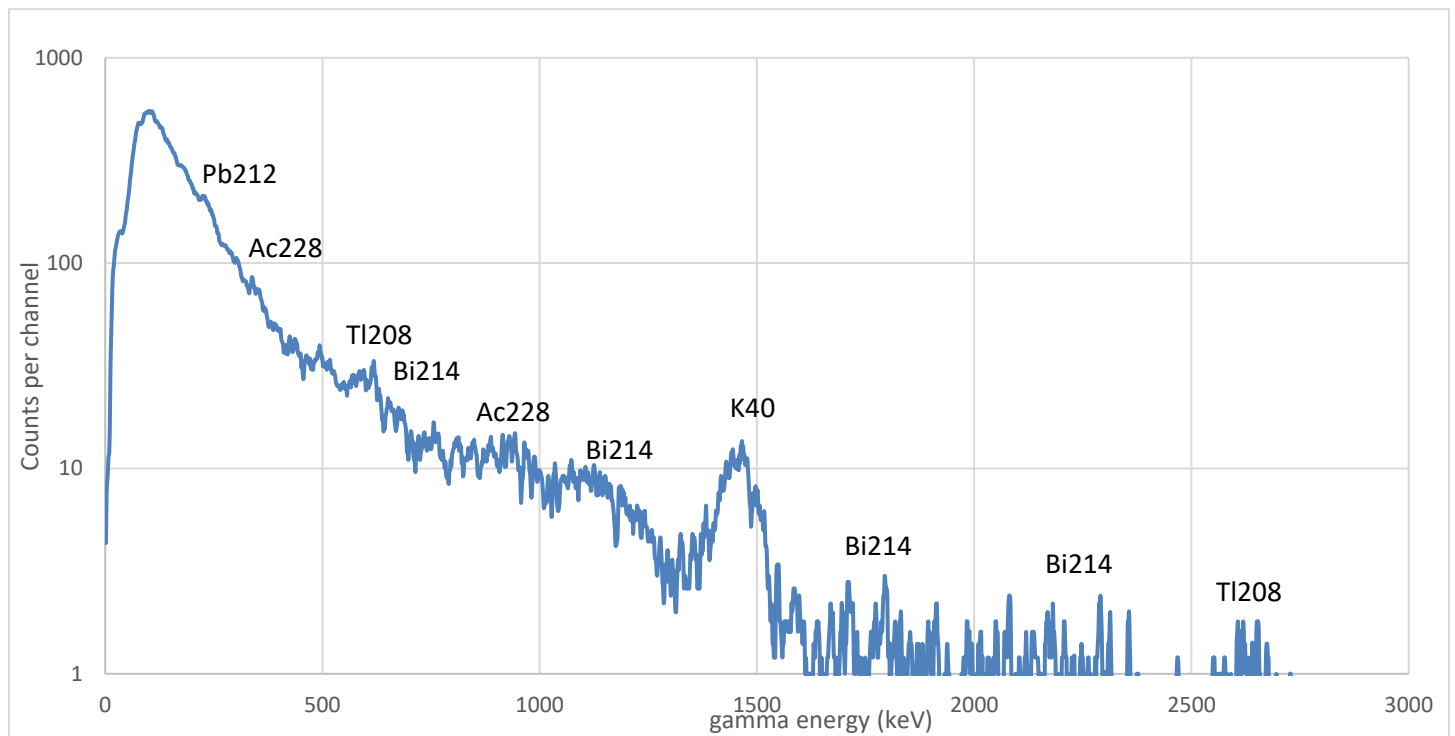
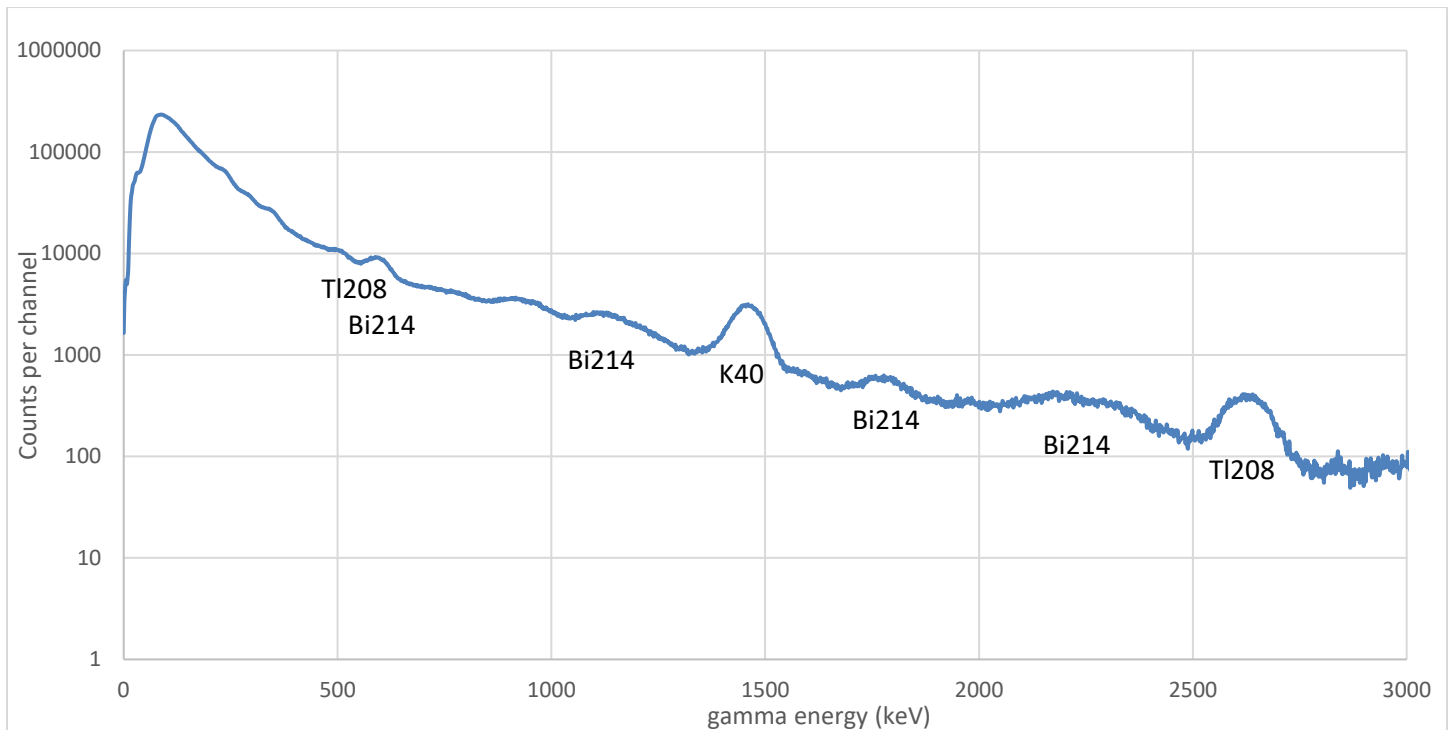


Figure 6. Background Gamma Spectrum (36 hours)



Analysis of the spectra taken inside the building and the background spectrum reveals peaks identified as TI-208, Bi-214, and Ac-228, which are decay isotopes of naturally occurring U-238 and Th-232. K-40 is naturally occurring in background. Peaks identified as Pb-212 (239 keV) and Ac-228 (338 keV) can also be seen on the spectrum inside the building. These two peaks are also in the background spectrum, but are much smaller and much more difficult to decipher against background. The isotopes found are consistent with naturally occurring thorium. Analysis of the count rate in the 2615 keV TI-208 peak reveals that the count rate in the building is 2-3 times higher than the count rate in background. The conclusion is that the building material contains higher than usual concentrations of natural thorium. This explains the IFB failure for all measurements made in the TA-16-306 building. No LANL-derived isotopes were found.

The conclusion is that TA-16-306 contains building materials with higher than usual natural thorium and therefore meets the IFB criteria. As such, it may be free-released to the public under DOE Order 458.1.

Regulatory Status of Radioactive Material in the Building 16-306

Naturally occurring radioactive materials (NORM) are not regulated under the *Atomic Energy Act of 1954* (AEA), as amended. Whether a particular item meets the definition of NORM is a definition of exclusion (i.e., the item is not source material, not byproduct material, etc.)

Several DOE Orders, including Order 458.1, do regulate "byproduct material" as defined in the AEA sections 11e.(1) to 11e.(4). Some byproduct material is also NORM. The thorium present in building 16-306 does not meet the definition of AEA byproduct material and it would be inappropriate to regulate it as such.

DOE Order 435.1, chg 2, *Radioactive Waste Management Manual*, specifically defines NORM as “Naturally occurring materials not regulated under the *Atomic Energy Act of 1954*, as amended, whose composition, radionuclide concentrations, availability, or proximity to man have been increased by or as a result of human practices.” Order 435.1 specifically excludes NORM from its definition of low-level waste.

Thorium has never been used by LANL as part of its operations. Most commonly, uranium used at LANL is depleted, but the presence of Bi-214 suggests the uranium is natural rather than depleted. These historical facts, combined with a complete lack of removable radioactive material throughout the building, indicate that the radioactive material embedded in building materials is naturally occurring and was a part of the building materials / items at the time that they were sourced. Since NORM is specifically excluded from regulation by the AEA and by DOE, these items and materials are outside of LANL’s radiological regulatory scope.

Despite the fact that naturally occurring thorium is outside of LANL’s regulatory scope, its presence in building materials should be properly documented.. All building debris to be disposed must meet the receiving facility’s waste acceptance criteria, which may or may not include restrictions on NORM. EPC-ES recommends that the project work with its Waste Management Coordinator to ensure proper waste characterization.

Conclusions

Given the results of the survey described above, EPC-ES recommends no restriction on disposition of building materials. Under DOE O 458.1, the structures and materials associated with building 16-306 contain only NORM and are candidates for free release to the public without additional surveys.

References

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LANL 2015a. Technical Project Plan ENV-ES-TPP-001, *Data Quality Objectives for Measurement of Radioactivity in or on Items for Transfer into the Public Domain*, Revision 1. 12 December 2015.

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